

REMARKS

Claims 1-2, 7-8, 17-22 and 25-31 are present in the application. Of these, dependent Claim 29 is presently withdrawn from examination (as directed to the non-elected species of Figure 1), but Claim 29 will again become subject to examination in this application in the event of allowance of the corresponding generic independent claim (Claim 25). In view of the remarks which follow, reconsideration of this application is respectfully requested.

Rejection Under 35 U.S.C. §103

Independent Claim 1 stands rejected under 35 U.S.C. §103 as obvious in view of a combination of teachings from Telkes U.S. Patent No. 2,677,367 and newly-cited Voorhes U.S. Patent No. 5,390,734. This ground of rejection is respectfully traversed, for the following reasons. Claim 1 is directed to a heat sink which includes an enclosure defining a cavity, and a phase change material disposed within the cavity. Claim 1 recites that the enclosure has "a highly thermally conductive portion composed of a composite of highly thermally conductive fibers disposed in a matrix; . . . a plurality of said fibers extending externally of said matrix and into said cavity to provide a porous, highly thermally conductive material integral with and thermally coupled to said highly thermally conductive portion". Claim 1 adds that the phase change material is "disposed in said porous material in said cavity".

The Telkes patent discloses in Figure 4 a heat storage unit 12 which stores heat by using a chemical such as disodium orthophosphate to absorb heat as the chemical changes from a solid to a liquid. Telkes uses this chemical due to

its high latent heat of fusion. However, when this chemical freezes, it can crystallize into either of at least two different hydrates, for example as discussed at line 45 in column 1 of Telkes. Telkes teaches that, for proper operation, it is desirable for the liquid chemical to crystallize or freeze into one specific type of hydrate, and to do so predictably. According, Telkes uses a "crystal promoter" structure in order to ensure that the desired hydrate will crystallize, and that the undesired hydrates will not crystallize. The crystal promoter structure may be either cellular glass or glass wool, as respectively discussed at line 32 of column 3, and line 23 of column 4. The crystal promoter is suspended in the housing cavity, but it is not attached to any of the walls of the cavity, for example as noted at lines 43-46 of column 4. Telkes does not teach or suggest that the cellular glass or glass wool is highly thermally conductive. In fact, Telkes does not appear to include anything which teaches or suggests that thermal conductivity would be desirable or provide any useful benefit. Instead, Telkes emphasizes that the intended function of the cellular glass or glass wool is to promote certain crystal growth.

Thus, Telkes clearly fails to teach or suggest an enclosure which has a highly thermally conductive portion composed of a composite of highly thermally conductive fibers disposed in a matrix, where a plurality of the fibers extend externally of the matrix and into the cavity in the enclosure in order to provide a porous and highly thermally conductive material within which the phase change material is disposed. Consequently, the issue is whether these defects in the teachings of Telkes are cured by any teachings in the Voorhes patent. It is respectfully submitted that these defects are not cured by Voorhes.

More specifically, the Office Action relies on Figure 11d of Voorhes, which discloses a plurality of parallel and spaced graphite fibers 74 that are thermally conductive, and that each have an upper end embedded in a block 75 which is made of an adhesive material. This Office Action asserts that it would be obvious to modify the Telkes apparatus to include the device shown in Figure 11d of Voorhes. In particular, the Office Action postulates that it would be obvious that the block 75 could be a portion of the wall of Telkes, and that the fibers 74 could be disposed in the cavity of Telkes. However, Applicants respectfully submit that this would not be obvious, for the following reasons.

First, it should be noted that Figures 11a through 11e of Voorhes show various successive steps in a process for making a device which is shown in Figure 11e. Consequently, the device shown in Figure 11d of Voorhes is not any kind of final product, but represents merely an intermediate step in the overall process of making the device shown in Figure 11e. In other words, Voorhes does not teach or even suggest that the device of Figure 11d is capable of any useful operation by itself, in the specific form which is shown in Figure 11d. To the contrary, Voorhes teaches that further changes are needed in the device of Figure 11d, in order to reach the final configuration which is shown in Figure 11e. Consequently, it is respectfully submitted that a person of ordinary skill in the art would have absolutely no inclination to take the device shown in Figure 11d of Voorhes and view it as a final operational configuration which could be incorporated into some other type device. In fact, Voorhes effectively teaches away from this. Consequently, it would not be an obvious matter to take the incomplete device shown in Figure 11d of Voorhes and to incorporate it into the Telkes apparatus or any other apparatus.

A second consideration is that a person of ordinary skill in the art would have no motivation to attempt to combine Telkes and Voorhes in the first place. In this regard, and as discussed above, Telkes provides a porous material within an enclosure for a very specific purpose, namely for controlling the type of crystallization experienced by a phase change material. This has nothing at all to do with thermal conductivity. In contrast, Voorhes has no teachings on techniques for controlling crystallization, and certainly does not teach or suggest that the device of Figure 11d (or any other disclosed device) would be of any benefit in achieving control over any type of crystallization process, much less the specific crystallization process involved in the Telkes device. It would therefore not be obvious to replace the porous material of Telkes (which was specifically selected for its operational characteristics in controlling crystallization) with any of the devices shown in Voorhes, because Voorhes does not teach or suggest that any device disclosed therein would have any beneficial characteristic with respect to controlling any crystallization process.

The pending rejection under §103 is not based on Figure 11e of Telkes. However, for purposes of completeness, and in order to expedite examination of the present application, a brief comment is offered regarding Figure 11e. In particular, Voorhes teaches that, as to the portions of the fibers 74 which are outside the block 75, these fiber portions are to be drawn together as tightly as possible, in order to form a tightly packed bundle 77 of these fibers. The splay region 73 is configured to effect the transition from the block 75 to the bundle 77 in the shortest possible distance. The bundle 77 is clearly not a "porous" arrangement which can have a phase change material disposed therein. Thus, with reference to Figure 11e, the teachings of Voorhes run directly

contrary to the teachings of the present invention. In particular, Claim 1 recites fibers that extend out of a thermally conductive portion of an enclosure and serve as a material which is sufficiently "porous" so that a phase change material can be present within the porous material. In contrast, Voorhes teaches that the portions of the fibers outside the block 75 are to be packed as tightly as possible (as shown at 77 in Figure 11e), such that the result could not even remotely be considered a "porous" material, much less a porous material that can have a phase change material disposed therein. Thus, if Telkes was modified in light of the device shown in Figure 11e of Voorhes, the result would not be the subject matter recited in Claim 1, because Voorhes teaches directly away from a significant and distinctive characteristic of the subject matter of Claim 1.

For the reasons set forth above, it is respectfully submitted that it would not be obvious to combine the teachings of Telkes and Voorhes in the first place, and that even if teachings from Telkes and Voorhes are combined, the result is not a device of the type recited in Claim 1. It is therefore respectfully submitted that Telkes and Voorhes do not, separately or in combination, render obvious the subject matter recited in independent Claim 1 of the present application. Claim 1 is therefore believed to be allowable, and notice to that effect is respectfully requested.

Comment Regarding Office Action

The most recent prior Office Action (mailed June 6, 2000) rejected Claims 25-27 and 30-31 under 35 U.S.C. §102 as anticipated by Telkes, and also included a rejection of Claims 26 and 31 under the first paragraph of 35 U.S.C. §112, on the ground that these claims lack support in the originally-filed specification. Applicants subsequently filed a Response on

June 21, 2000, which presented arguments regarding both of these grounds of rejection. In the currently pending Office Action, in lines 4-5 on page 2, the Examiner states that these prior arguments "are moot in view of the new ground(s) of rejection". However, the current Office Action does not set forth any new ground of rejection as to Claims 25-27 and 30-31. Instead, at lines 14-18 on page 3 and lines 4-6 on page 4, the pending Office Action sets forth a verbatim copy of the §102 and §112 rejections from the prior Office Action, without a single statement in response to Applicants' arguments against these rejections. Further, line 4 on page 6 contains the heading "Response to Arguments", which suggests that the ensuing paragraphs will present a discussion of the arguments which were presented in Applicants' prior Response filed June 21, 2000. But the ensuing paragraphs do not do this. Instead, the two ensuing paragraphs which run from line 8 on page 6 to line 5 on page 7 have been copied verbatim from the prior Office Action mailed June 6, 2000, and thus predate Applicants' arguments filed on June 21, 2000. Consequently, these paragraphs also fail to address Applicants' arguments. Moreover, these two paragraphs on pages 6 and 7 have some problems.

For example, at lines 9-10 on page 6, the Office Action states that the Board of Appeals issued a Decision in this case which rules that Figure 1 is abandoned. But as explained by Applicants in the prior Response filed on June 21, 2000, the appeal in this case dealt with the species of Figure 2, rather than the species of Figure 1, and the Board's decision made no ruling at all with respect to Figure 1, much less a ruling that the species of Figure 1 is abandoned. To the extent that the Examiner again makes the statement that the Board ruled Figure 1 is abandoned, which is flatly wrong and is also inconsistent with the record, it would appear that

the Examiner did not bother to read Applicants' prior arguments filed on June 21, 2000.

As a further example, lines 12-20 on page 6 of the present Office Action assert that the originally-filed application fails to teach that the elected species of Figure 2 has a cavity which can be fully filled with a phase change material. However, in Applicants' prior response filed on June 21, 2000, Applicants explained precisely where this feature is disclosed in the originally-filed application papers. Accordingly, this is another example of a statement copied from a prior Office Action which is clearly wrong, and further suggests that Applicants' prior arguments have not been considered.

Still another example appears at lines 3-5 on page 7 of the pending Office Action, where the Examiner makes statements that are not consistent with the disclosure of Telkes. These statements are copied verbatim from a prior Office Action, and suggest that the Examiner did not read the arguments set forth in the prior Response filed on June 21, 2000, which specifically discuss why the statements in the Office Action are not accurate as to the disclosure in Telkes.

Another similar problem exists with respect to the objection to the specification under 37 CFR §1.71, which appears at line 6-12 on page 3. This objection has also been copied verbatim from the prior Office Action mailed June 6, 2000, and thus predates the arguments filed by Applicants on June 21, 2000. The pending Office Action lacks any language at all which is responsive to the arguments which Applicants filed on June 21, 2000 regarding the §1.71 objection.

For the reasons discussed above, it is respectfully submitted that the presently pending Office Action is not complete, because Applicants' prior arguments have not been considered in the manner required by 37 CFR §1.112. Instead,

as stated in the Office Action, Applicants' arguments were apparently ignored as "moot in view of the new ground(s) of rejection", even though the Examiner actually maintained certain pre-existing rejections of Claims 25-27 and 30-31, without presenting any new ground of rejection as to these claims.

Consequently, with reference to the rejections and objections raised in the currently pending Office Action under 37 CFR §1.71, 35 U.S.C. §102, and the first paragraph of 35 U.S.C. §112, it is not entirely clear to Applicants how they should respond to these issues. In particular, the Examiner raised these same issues in the prior Office Action mailed June 6, 2000, Applicants filed appropriate responsive arguments on June 21, 2000, and the pending Office Action now presents exactly the same rejections and objections using exactly the same language, with absolutely no discussion of any of the arguments presented by Applicants. For example, as noted above, Applicants' prior arguments filed on June 21, 2000 point out that the Decision by the Board of Appeals clearly dealt only with the species of Figure 2, and to the extent the Examiner has again incorrectly stated that the Board ruled Figure 1 is abandoned, Applicants do not know of any appropriate response other than to again explain that the Board's Decision dealt only Figure 2, and not Figure 1.

In the prior Response filed June 21, 2000, Applicants made a good faith reply to each of the issues under §102, §112 and §1.71, in a manner which should be appropriate to advance the examination of the present application. Faced now with verbatim duplicates of those prior objections and rejections, without any response to Applicants' intervening arguments, the best reply known to Applicants is precisely the same reply that Applicants made to the original presentation of these same issues. For the convenience of the Examiner,

and since it would be inappropriate to incorporate by reference an argument from a prior Response, Applicants are setting forth below the same basic arguments which were presented on these issues in Applicants' last Response.

Status of the Non-Elected Species of Figure 1

The present application is a continuation of U.S. Serial 08/406,226 filed March 17, 1995. In the parent application, an election of species requirement was imposed between the species of Figure 1 and the species of Figure 2, pursuant to which Applicants elected the species of Figure 1 for examination in the parent application. No appeal was filed during examination of the parent application. Applicants then filed the present divisional application, in order to pursue examination of claims directed to the species of Figure 2. (It should be noted that Applicants have not lost or waived the right to file a further divisional application which again presents claims directed to the species of Figure 1).

In the present application, examination has been directed to claims which read onto the species of Figure 2. An appeal was previously filed in the present application, resulting in a Board Decision which reversed the pending grounds of rejection, and which directed the Examiner to consider certain other issues enumerated by the Board in its Decision. Examination on the merits has continued after the appeal, still focusing on claims that read onto the species of Figure 2.

In the presently pending Office Action, there is a statement (lines 9-10 on page 6) that Claims 26 and 31 "do not read on the embodiment of Figure 1 since this non-elected species is abandoned per the Board of Appeals Decision". This statement in the Office Action is respectfully traversed. The

Board's Decision occurred in the present divisional application, and dealt only with claims that read onto Figure 2. The Decision never addressed Figure 1 at all, and certainly did not indicate that the species of Figure 1 was abandoned. In fact, as discussed above, Applicants still have the right to obtain examination of claims that read onto Figure 1, by filing a further divisional application.

In addition, the present application includes several generic claims that read onto the elected species of Figure 2, and also onto the non-elected species of Figure 1. This includes Claims 25, 26 and 31, all of which read onto both Figure 1 and Figure 2. In the event that Applicants ultimately obtain allowance of one or more of these generic claims, the election of species requirement will automatically be canceled, and examination in the present application will again be directed to both Figure 1 and Figure 2. In this regard, and as recognized in 37 CFR § 1.146 and also MPEP 809.02(c), if Applicants ultimately obtain allowance of generic Claim 25, then dependent Claim 29 (which depends from Claim 25 and is currently withdrawn from examination because it reads onto Figure 1 but not Figure 2) will automatically revert to active status, and will have to be considered on the merits. Consequently, for the various different reasons discussed above, the Examiner is incorrect in stating that the examined claims do not read onto the species of Figure 1, and is also incorrect in stating that the species of Figure 1 has been abandoned.

Support for Claims 26 and 31

On page 3, the Office Action rejects Claims 26 and 31 under the first paragraph of 35 U.S.C. §112, on the ground that they each recite subject matter which was not disclosed in the originally-filed application. This ground of rejection

was raised in a prior Office Action, and prompted Applicants to previously amend the specification by adding a paragraph on page 7. On page 3, the currently-pending Office Action raises an objection to this added paragraph under 37 CFR §1.71. These grounds of rejection and objection are respectfully traversed.

In this regard, lines 10-20 on page 6 of the Office Action explain the basis for this objection and rejection. More specifically, this portion of the Office Action first concedes that, in discussing the non-elected species of Figure 1, the originally-filed specification teaches on page 7 that the phase change material (PCM) can fully fill the remainder of the cavity (i.e. the portion of the cavity not taken up by the porous material). This portion of the Office Action then goes on to assert that the originally-filed specification does not include any similar teaching for the elected species of Figure 2. Applicants respectfully disagree, for the following reasons.

In discussing the elected species of Figure 2, the originally-filed specification states at lines 25-26 on page 7 that: "The PCM material 15 is then entered into the cavity as in the first embodiment". As noted above, the Examiner has conceded that the originally-filed specification teaches with respect to the species of Figure 1 that the PCM material can be entered into the cavity so as to "fully fill the remainder of the cavity" in a manner yielding "a PCM filled heat sink" (lines 7-12 on page 7). To the extent that the specification then teaches at lines 25-26 on page 7 that the PCM material is entered into the cavity of the species of Figure 2 in the same manner that it is entered into the cavity of the species of Figure 1, this means that the PCM in Figure 2 can also "fully fill the remainder of the cavity" in a manner yielding "a PCM filled heat sink", just as it did in Figure 1.

The Office Action then asserts that a PCM which partially fills a cavity might be capable of movement within the cavity, in either its solid phase or its liquid phase. However, this is not the issue. The issue is whether the PCM would be capable of significant movement where it fully fills the cavity. The Examiner's focus on a PCM which partially fills a cavity is based on the Examiner's assertion that the present application does not teach that the cavity in the species of Figure 2 could be fully filled with PCM. However, as discussed above, the originally-filed specification does teach that the PCM can "fully fill" the cavity in the first embodiment of Figure 1 (lines 1-7 on page 4, and lines 7-12 on page 7), and that the PCM can fully fill the cavity in the second embodiment of Figure 2 (lines 25-26 on page 7). The Office Action does not take the position that a PCM which fully fills the cavity would be capable of any significant movement, and Applicants respectfully submit that it would not be capable of significant movement. Consequently, and in view of the foregoing discussion, it is respectfully submitted that the paragraph added on page 7 does not introduce new matter into the disclosure of the present invention. Similarly, it is respectfully submitted that the subject matter of Claims 26 and 31 is supported by the originally-filed disclosure of the species in Figure 1, and is also separately supported by the originally-filed disclosure of the species in Figure 2, and therefore involves no new matter. For these reasons, the Examiner is respectfully requested to withdraw the rejection of Claims 26 and 31 under the first paragraph of §112, and to withdraw the objection to the specification under 37 CFR §1.71.

Rejection Under 35 U.S.C. §102

Independent Claims 25 and 30 each stand rejected under 35 U.S.C. §102 as anticipated by Telkes U.S. Patent No. 2,677,367. This ground of rejection is respectfully traversed, for the following reasons. With respect to when a claim is anticipated under §102, the Court of Appeals for the Federal Circuit has consistently held that: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed.Cir. 1987). Similarly, "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed.Cir. 1989). MPEP §2131 cites these two cases for precisely the same principle that they are cited here, and in fact quotes the same language from these cases that is quoted here.

In the present application, independent Claim 25 includes a recitation of "a highly thermally conductive porous material disposed within said cavity and coupled physically and thermally to said highly thermally conductive portion of said enclosure". Similarly, independent Claim 30 recites "a highly thermally conductive porous material ... which is disposed within a cavity in said enclosure and which is coupled physically and thermally to said highly thermally conductive portion of said enclosure". It is respectfully submitted that these portions of Claims 25 and 30 recite distinctive features that the Telkes patent fails to teach or suggest.

More specifically, in setting forth the §102 rejection, the Office Action relies on Figure 4 of Telkes. As discussed above, Telkes discloses in Figure 4 a heat storage unit 12 which stores heat by using a chemical such as disodium

orthophosphate to absorb heat as it changes from a solid to a liquid, due to its high latent heat of fusion. Telkes uses a "crystal promoter" so that, when this chemical changes from a liquid to a solid, a desired hydrate will crystallize, and undesired hydrates will not. The crystal promoter may be either cellular glass or glass wool, as respectively discussed at line 32 of column 3 and line 23 of column 4. The crystal promoter is suspended in the housing cavity, but is not attached to the walls of the cavity, for example as noted at lines 43-46 of column 4. Telkes does not teach or suggest that the cellular glass or the glass wool discussed therein is highly thermally conductive. Further, Telkes does not appear to include anything which teaches or suggests that thermal conductivity of the cellular glass or glass wool would be desirable or provide any useful benefit. Telkes emphasizes that the intended function of these components is to promote certain crystal growth, and does not discuss whether or not they may be thermally conductive.

On page 7 of the pending Office Action, the Examiner observes that the container 10 of Telkes may be made of a heat-conductive material, such as a metal or a glass. The Examiner then asserts that, if the container 10 is made of a heat-conductive glass, the calcium-containing glass wool matrix 14' must also necessarily be heat-conductive. However, there is no teaching in Telkes that the glass wool matrix 14' is made from the same glass material as the container 10, and thus there is no basis for the Examiner's assertion that the glass wool matrix 14' is necessarily heat-conductive. As mentioned above, Telkes focuses on how the glass wool matrix 14' affects crystallization of disodium orthophosphate, and does not discuss whether or not this matrix is thermally conductive.

The Examiner goes on to note the teaching at lines 43-46 in column 4 of Telkes that the glass wool matrix 14' substantially fills the interior of the container, in a manner "so that it will not settle to the bottom". The Examiner then asserts that this means "the matrix 14' is coupled physically to the wall" of the container. But there is no teaching in Telkes that the glass wool matrix 14' is physically coupled to the wall of the container 10. In fact, Telkes rather clearly teaches that the glass wool matrix 14' is not physically coupled to the container 10.

As discussed above, anticipation under §102 requires that a reference like Telkes disclose "each and every" element recited in the claim, or in other words effectively the "identical invention" that is recited in the claim. Telkes fails to meet this requirement as to Claims 25 and 30. In particular, Claims 25 and 30 each recite "a highly thermally conductive porous material", whereas Telkes has no teaching that the particular substance used by Telkes for a porous material is highly thermally conductive. Moreover, Claims 25 and 30 each recite that the porous material is "coupled physically" to an enclosure in which it is disposed, whereas Telkes teaches that the porous material of Telkes is not coupled physically to its enclosure. Applicants therefore respectfully submit that Telkes does not anticipate the subject matter of Claims 25 and 30 under §102, because Telkes fails to meet the requirement of disclosing each and every element which is recited in these claims. Claims 25 and 30 are therefore believed to be allowable, and notice to that effect is respectfully requested.

Dependent Claims

Claims 2, 7-8 and 17-22 depend from Claim 1, and are also believed to be allowable over the art of record, for

example for the same reasons discussed above with respect to Claim 1. Similarly, Claims 26-28 and Claim 31 respectively depend from Claim 25 and Claim 30, and are also believed to be allowable over the art of record, for example for the reasons discussed above with respect to Claims 25 and 30.

Conclusion

Based on the foregoing, it respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to telephone the undersigned attorney at (214) 953-6684.

Although Applicants believe that no additional fees are due, the Commissioner is hereby authorized to charge any fees required by this paper, or to credit any overpayment, to Deposit Account No. 02-0384 of Baker Botts L.L.P.

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